ODP-1160-77
TADS- E019-77
14 June 1977

STATINTL MEMORANDUM FOR: [redacted]
C/MS/ODP

STATINTL VIA : [redacted]
C/SPS/ODP

STATINTL FROM : [redacted]
TADS Project Manager

SUBJECT : TADS Long Range Planning

1. Attached is a copy of the TADS Long Range Planning Document for your review.

2. Please forward any comments and questions to:

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TADS LONG RANGE PLANNING DOCUMENT

15 June 1977

TABLE OF CONTENTS

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PURPOSE

The purpose of this document is to provide the necessary planning and direction for ODP support of the Telemetry Analysis and Display System (TADS). Specific long range planning issues relevant to TADS will be raised. Information and alternatives related to each issue will be presented. Then a recommendation for the resolution of the issue will be offered.

Our objective is to match TADS' requirements with the proper resources. This can be achieved with effective planning for TADS growth. The planning for TADS growth is predicated on resource information immediately available combined with an anticipated growth rate.

SCOPE

This document describes the Telemetry Analysis and Display System (TADS) configuration as it will initially exist and expands incrementally to accommodate the requirements established by the user, the Office of Weapons Intelligence (OWI). In addition, it will define a system configuration which should satisfy all known OWI TADS requirements. The period herein extends from system acceptance to the end of the five year system's life (March 1978 to March 1983).

1.0 SYSTEM DEFINITION

The Telemetry Analysis and Display System (TADS) will be a computerized capability to support the analysis of telemetry and other time series data. TADS will be an interactive environment to consolidate analysis presently done manually and on general purpose batch computers. TADS will be the integration of Government Furnished hardware and software with hardware and software supplied by the TADS Contractor, [redacted] and commercially available hardware (See Appendix A). The initial TADS hardware configuration will be a host computer (IBM 360/67) and its peripheral equipment, a Graphics Interface Controller (GIC) that will provide the interface between the host computer and two Graphic Stations. A Graphic Station is made up of a Graphics Station Controller (GSC); a Graphics Display Terminal (GDT), an Alphanumeric Display Terminal (Delta Data 5260 with lightpen), an Electrostatic Printer/Plotter (ESP), one data tablet and a Remote Job Entry (RJE) link to the ASP System will also be provided.

STATINTL

TADS will support aerospace mission and program evaluations by the engineering analyst. Also, TADS will support computational facilities for mathematical manipulation of data files. These facilities generate transformed data files that are added to the data base and measured data values which can be displayed and/or entered into result files.

Hardcopy displays will be generated to document analysis and for inclusion in published reports. TADS will support the continued development of new computational programs for data editing and engineering analysis. The new programs will include interactive graphics programs which use the TADS access facilities for the data base, alphanumeric terminals, the graphic display, and computational functions.

1.1 GRAPHICS INTERFACE CONTROLLER (GIC)

Functional Description

The GIC is a PDP 11/34 which is intended to provide a controlled, two-way, high-speed path for data communications between an IBM 360/67 and up to 8 Graphics Stations. The Graphics Stations each consist of a display unit and a controller (mini-computer). The GIC is to include all the hardware to connect the 360/67 channel to the mini-computer. The GIC shall support a minimum net data rate of 100,000 bytes per second for each of the Graphics Stations. The GIC shall be capable of driving the dedicated cabling necessary to locate the Graphics Stations up to 2,000 feet away from the host computer (IBM 360).

1.2 GRAPHICS DISPLAY STATION

Functional Description

Each TADS Graphic Display Station consists of a DEC PDP 11/34 programmable Graphics Station Controller (GSC), a Vector General 3401 Graphics Terminal, a GFE 5260 Delta Data Alpha-numeric Terminal, user entry devices, and console (work table). The GSC and Graphics Terminal are modular in design and provide for future expansion by means of field installation of additional memory, logic ROMS, or upgraded software.

2.0 ADDITIONAL GRAPHICS STATIONS PROCUREMENT

2.1 INITIAL PROCUREMENT

The initial procurement is for a system that will connect two (2) Graphics Stations to the host IBM 360/67. The components of this initial procurement are as follows:

a) Two (2) Graphics Stations
b) Two (2) Alphanumeric Stations (Light pen Delta Data Terminals)
c) One (1) Electrostatic Printer/Plotter
d) One (1) Data Tablet

This hardware configuration is field expandable to support the following configuration:

a) Eight (8) Graphics Stations
b) Eight (8) Alphanumeric Stations
c) Two (2) Electrostatic Printer/Plotters
d) One (1) Data Tablet

The initial configuration shown in Figure 1 is expected to be operational in the first quarter of calendar year 1978.

2.2 HARDWARE OPTIONS

Under the existing TADS contract, the initial TADS hardware configuration can be expanded incrementally in the following manner:

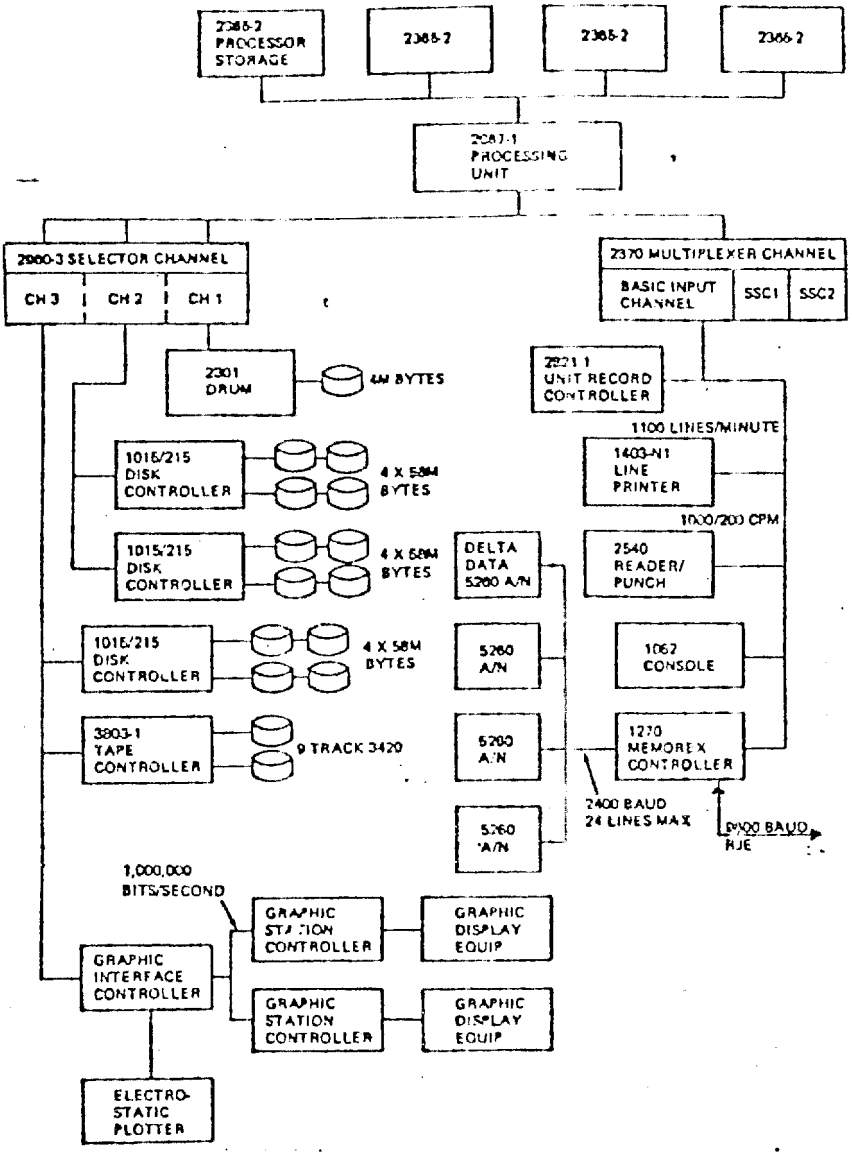
a) Four (4) additional Graphics Stations to be added one year after the initial TADS system acceptance by the Government.

b) One (additional Electrostatic Printer/Plotter to be added one and one half years after the initial TADS system acceptance by the Government.

c) Two (2) additional Graphics Stations to be added two (2) years after the initial TADS system acceptance by the Government.

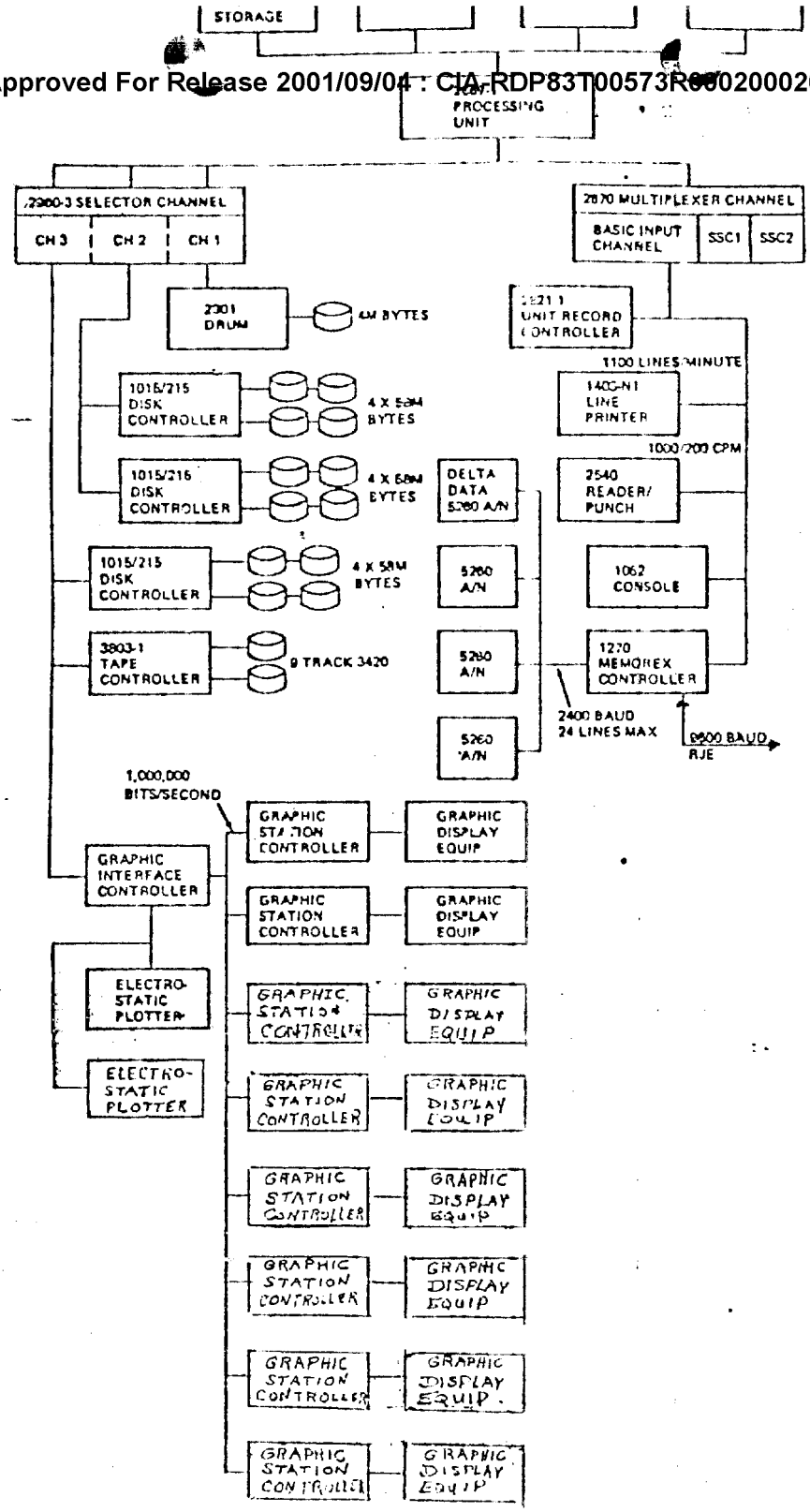
This procurement schedule was included as an option in the TADS Contract. Its purpose was to obtain basic pricing data to determine a maximum system cost. The ODP FY77 TADS budget and OWI's requirements suggest that this option should be implemented and accelerated (See Section 8, Budget Analysis).

Figure 2 illustrates the TADS configuration after the Hardware Options have been purchased.



Initial TADS Hardware Configuration

Figure 1



Planned TADS Hardware Configuration

Figure 2

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The following chart compares the contractor's price based on the purchase of the additional TADS equipment and the price paid if the Government were to purchase the equipment from the individual vendors. The labor cost for equipment installation, system integration, and operational certification has been included in the contractors price. The funds available for TADS hardware purchases are entered as the last entry of the chart. The Contractor's price, $686,939.00, was calculated using the Government Index value as of 1 January 1977. The price may be slightly higher by August 1977, but we feel that the increase in price will not exceed 4% of the stated price.

TADS EQUIPMENT PURCHASE OPTIONS

	Contractor Price	GFE Price
Addition of:		
Four Graphic Stations	$439,880.00	$265,488.00
Addition of:		
One Electrostatic Printer/ Plotter	$ 20,941.00	$ 10,042.00
Addition of:		
Two Graphic Stations	$226,118.00	$132,744.00
	$686,939.00	$408,274.00

TADS FY-77 Budget: $845,435.00

2.3 RECOMMENDATIONS

o TOTAL PURCHASE OF TADS OPTIONAL HARDWARE

The TADS FY-77 budget is sufficient to purchase all of the hardware options at one time and have funds remaining for additional hardware purchases if desired. OWI has a requirement for the additional six Graphic Stations and two additional plotters. Our recommendation is to apply the FY-77 funds to all of the additional hardware to be installed in the second and third quarters of calendar year 1978.

The Government has two choices with respect to the procurement of additional hardware for TADS. One is to purchase the hardware directly from the vendors and the other is to purchase the hardware through the TADS Contractor. The advantage of procuring the hardware directly is obvious - a potential savings of over $200,000. However, the feasibility of this approach is in question. Below are listed several factors which we feel support the recommendation not to GFE the additional hardware but to procure the options through the TADS Contractor:

1. ODP has until 30 September to obligate its FY77 TADS Funds. Initiating procurements with four vendors and the TADS Contractor (installation support) in addition to managing the TADS development would be difficult.

2. If the hardware is GFed, SPS/ODP would effectively become a system integrator. ODP would have to allocate resources for such things as hardware installation, hardware/software integration, factory acceptance tests at vendor's facilities, and onsite hardware acceptance from several vendors.

3. The additional ODP manpower required to manage the efforts discussed above are estimated to be at least one manyear.

4. The Contractor Price ($686.939) can most likely be negotiated downward for at least two reasons. Purchasing all the additional hardware at one time will provide some quantity discounts which could be passed on to the Government. Also, a more optimal use of procurement and installation manpower would be achieved by a quantity pruchase.

o HARDWARE PURCHASE IN ADDITION TO THE EIGHT GRAPHIC STATION CONFIGURATION

OSO/SAD has requested that one of the eight Graphic Stations be located in the GD76 area within Headquarters. This request has been agreed to by OWI and SPS/ODP. The responsibility for preparing the GD76 area for the Graphic Station rests with OSO/SAD. This area should be ready by the Spring of 1978. Further, OSO/SAD requested that an additional Electrostatic Printer/Plotter be purchased for their Graphics Station installation. OSO/SAD's justification for this request made it clear that a printer/plotter is essential to their use of a Graphics Station. The budget is adequate to supply the additional (third) electrostatic printer/plotter. We recommend its purchase be included with the purchase of the six (6) Graphic Stations. This is a change to the existing contract of approximately $19,000.00.

OWI requests that six (6) additional Alphanumeric stations be purchased with the six Graphics Stations. This is in effect 12 additional lightpen Delta Data's. The budget is adequate for both additional purchase requests (printer/plotter and six alphanumeric stations). The remaining funds after this additional purchase would be approximately $101,000.00. A portion of this excess will be applied toward planned software scope changes such as interfacing TADS with TMS.

3.0 OPERATIONAL ENVIRONMENT ESTABLISHED

3.1 RELOCATE IBM 360/67 PERIPHERALS

Once TADS becomes an operational system, the TADS environment will become more production/development oriented as opposed to the present implementation environment. A tape library will be needed to support TADS. Either this must exist in 1D16 or several 360/67 peripherals must be relocated to GC03.

o RECOMMENDATION

The IBM 360/67 peripherals used by the contractor's implementation team in 1D16 will no longer be needed there. The requirement for TADS access to the 1D16 area will diminish also after system acceptance. The following 360/67 peripherals are recommended to be relocated from 1D16 to GC03 by the second quarter of calendar year 1978.

a. Both TADS Tape Drives
b. TADS printer (IBM 1403)
c. TADS card reader (IBM 2540)
d. TADS operator's terminal.
e. TADS TMS terminal

Better operator response will be achieved by locating the above mentioned equipment in GC03. In addition, it will be easier to support non-prime time TADS use.

3.2 Replace Memorex with COMTEN

The data processing support requirements for OWI are multi-system oriented. The following information gives some idea of the relationship between the various data processing systems and the location and number of users within OWI:

Data Processing System	Number of OWI Users	OWI User Division
VM	157-170	1. Program Analysis Division (PAD) 2. Aerospace Vehicle Analysis (AVAD)
GIMS	41	1. " (PAD) 2. " (AVAD)
TADS	50-75	1. " (PAD) 2. " (AVAD)
Interim Safe	24	1. Naval System Division (NSD) 2. Defensive System Division (DSD) 3. Offensive and Space Systems Div. (OSSD)

Although all divisions within OWI may not explicitly be mentioned as being TADS users, they will not be prohibited from doing so occasionally. For example, systems analysts within NSD, DSO, or OSSD will find it convenient to accumulate and analyze collectively the results of engineering analysis via a TADS alphanumeric terminal. This requirement for multisystem access provides the motivation for the following recommendation.

o RECOMMENDATION

The Memorex interface to TADS should be replaced with a COMTEN interface permitting maximum usage of the TADS processor in 1D16 and Delta Data's in OWI space. The COMTEN installation should be completed in conjunction with the installation of additional Graphic and Alphanumeric stations.

3.3 TADS TMS INTERFACE

Once the TADS tape units are in GC03, it makes sense to provide a TADS TMS interface to the tape library in GC03. This would simplify the TADS tape handling problems and provide a more timely response for tape handling related activities (i.e., volume fetching, label checking, volume mounting and dismounting).

o Recommendation

On receipt of interface specifications from SPD/ODP, a contract change should be initiated to provide for a TMS interface.

3.4 ADDITIONAL ONLINE DATA STORAGE

With the anticipated increase in the number of TADS users by late 1978, attention should be directed toward an upgrade in the TADS online storage capacity by that time.

At a maximum configuration, there could be as many as 24 virtuals active at one time. 18 of these 24 virtuals will most likely have 1 megabyte of memory.

Although this is not a firm requirement, we feel that data collected during the initial operating period will support the following recommendation.

o RECOMMENDATION

The addition of a drum and Calcomp 1015 should be considered before the summer of 1978 to allow for sufficient lead time for the equipment installation. The anticipated installation time would be during the first quarter of FY-78 (just after additional stations are operational).

3.5 DELAY DATA

The twenty (20) Delta Data Terminals presently within OWI represent 800 hours per week available for Delta Data access for the whole user population of OWI. The current utilization level is approximately 75% which represents 600 of the available 800 hours. Based on the assumption that a TADS analyst will require no more than two hours daily of alphanumeric station time, 750 hours per week are needed to support just a TADS user population of 75.

Granted, the final TADS configuration will increase the total number of Delta Data Terminals in OWI from 20 to 28, but only eight (8) are Alphanumeric Stations equipped with the light pen attachment.

O RECOMMENDATION

This information prompts the recommendation that the twenty (20) other Delta Data Terminals be replaced over a two year period with the light pen Delta Data's. The upgrading process should begin after the TADS system is operational and the usefulness of the light pen Delta Data has been determined.

3.6 CONVERSION TO VM

There are many advantages gained from the migration of TADS from the IBM 360/67 to IBM 370. The modular and system independent nature of TADS simplifies the effort considerably. The additional floor space gained by the removal of the IBM 360/67 is significant as compared to the space requirements of an IBM 370. Phasing out CP-CMS would unify and simplify the operating system and hardware maintenance requirements. The computer hours available for TADS could possibly be available to other users during the second and third shifts. Also, the possibility exists of either migrating all of OWI and OSO/SAD VM users to the TADS machine or including TADS in the general VM machine.

o RECOMMENDATION

The TADS should be implemented on a VM system no sooner than the second quarter of calendar year 1978 (post initial system acceptance). From a TADS point of view, the ideal time to convert to a VM system would be just after the installation of the additional Graphic and Alphanumeric Stations. This of course would alter the online storage recommendations made in Section 3.4. In any event we feel that the conversion should be planned for no later than FY 1979.

4.0 TADS GRAPHIC STATIONS

The first two TADS Graphic Stations will be installed in room 1D0023 of the Headquarters building. The remaining six Graphic Stations will be installed within headquarters in the following areas:

a. One in OSO/SAD area in GD76.
b. Five in 1D10 area.

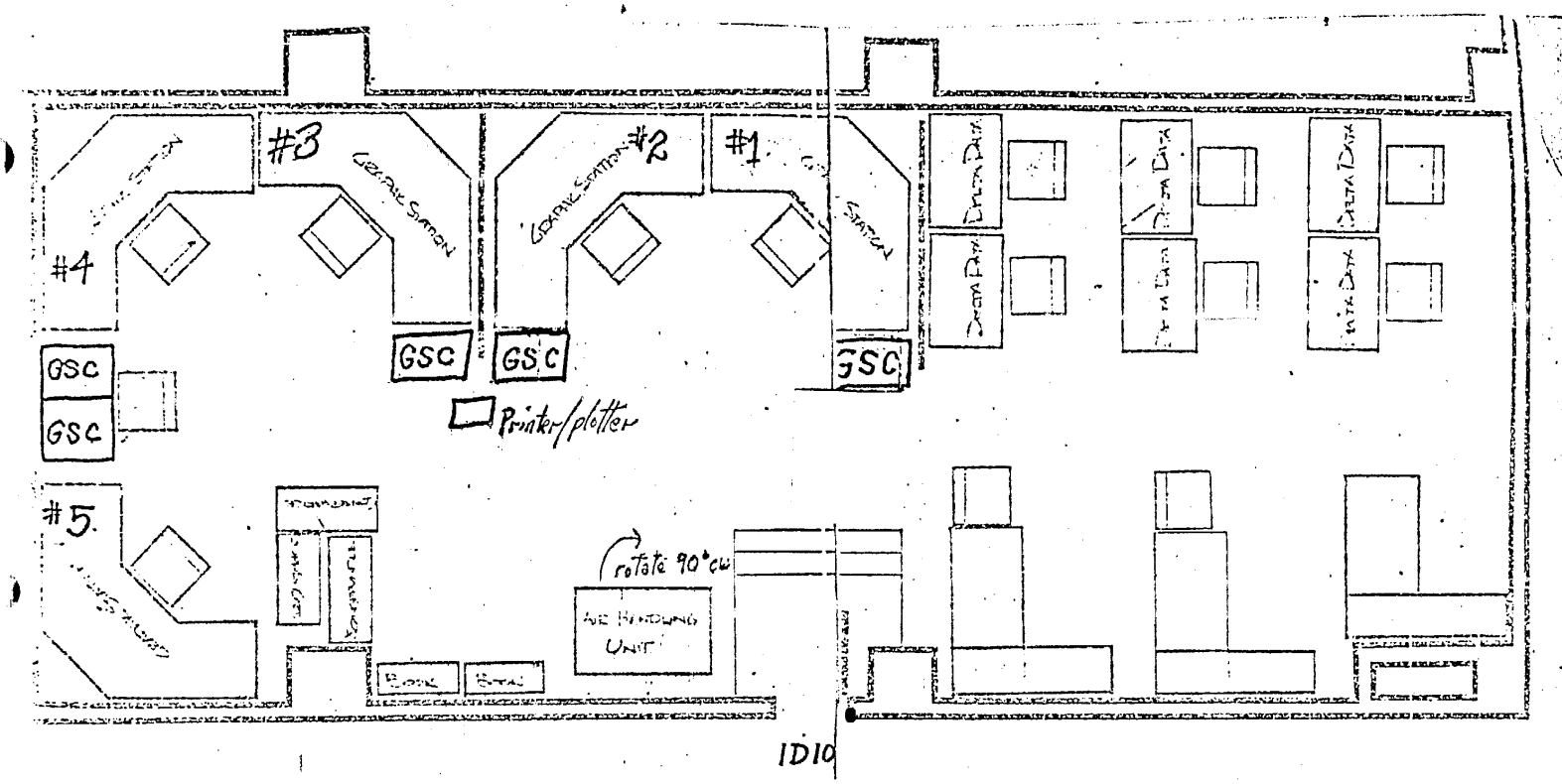
The installation for the six Graphics Stations is dependent on how the procurement of the hardware is resolved.

Several activities must precede the installation of a TADS Graphics Station:

ITEM	LEAD TIME REQUIREMENT
a. Installation space must be identified and approval obtained for hardware	Minimum of 2 months
b. Drawings obtained from Architect Staff	1 month
c. Environmental requirements met	1 month
d. Security requirements met	
e. Renovation activities	4 months
f. Equipment installation and checkout	2 months

o RECOMMENDATION

Activities prerequisite to a TADS Graphics Station installation by spring 1978 should be initiated by August of the previous year. OWI has indicated that the 1D10 area will be ready by June 1978. The 1D0023 area is ready now. A space requirements for a TADS Graphics Station were provided to OSO in May 1977. The following illustration depicts the 1D10 area with the proposed six additional Alphanumeric Stations.



5.0 TADS TRAINING

The TADS users are expected to be familiar with the CP-67/CMS operating environment prior to training for TADS. Training of TADS users will be conducted on a schedule consistent with the System Acceptance Test. Training courses will consist of classroom lectures, concurrent with laboratory training in a "hands-on" mode. Lecture material will progress from basic hardware utilization through the special applications associated to support lecture material. Specialized training requirements of the TADS disciplines will consist of specific course material directed toward the unique aspects of each discipline for TADS analysts, TADS programmers and TADS operators.

The following guidelines apply with regard to training:

a. Two training sessions of one week each will be conducted.

b. No more than thirty (30) students may be enrolled for TADS training.

c. The training sessions may be recorded on video tape aid used for future TADS training.

o RECOMMENDATION

OWI has allowed for six (6) representatives from ODP to attend the initial TADS users training course given by the contractor. The intent is that the students will be selected from among potential ODP TADS application programmers. The names of the people selected should be submitted to OWI by January 1978.

6. SUMMARY

The following three charts summarize the recommendations for planning the long range hardware requirements for TADS. The reader is reminded that the COMTEN, Drum, Disk Controller, and additional Alphanumeric Stations would be Government furnished rather than contractor provided hardware.

The budget analysis points out the proposed deviations from the current plan. We feel that the current budget shown in the budget analysis is adequate to allow for the additional hardware purchases.

The attached bubble chart shows chronologically the occurrence and relationship to one another of the key milestones in our current plan. The sequential relationship of the key milestones can be seen clearly.

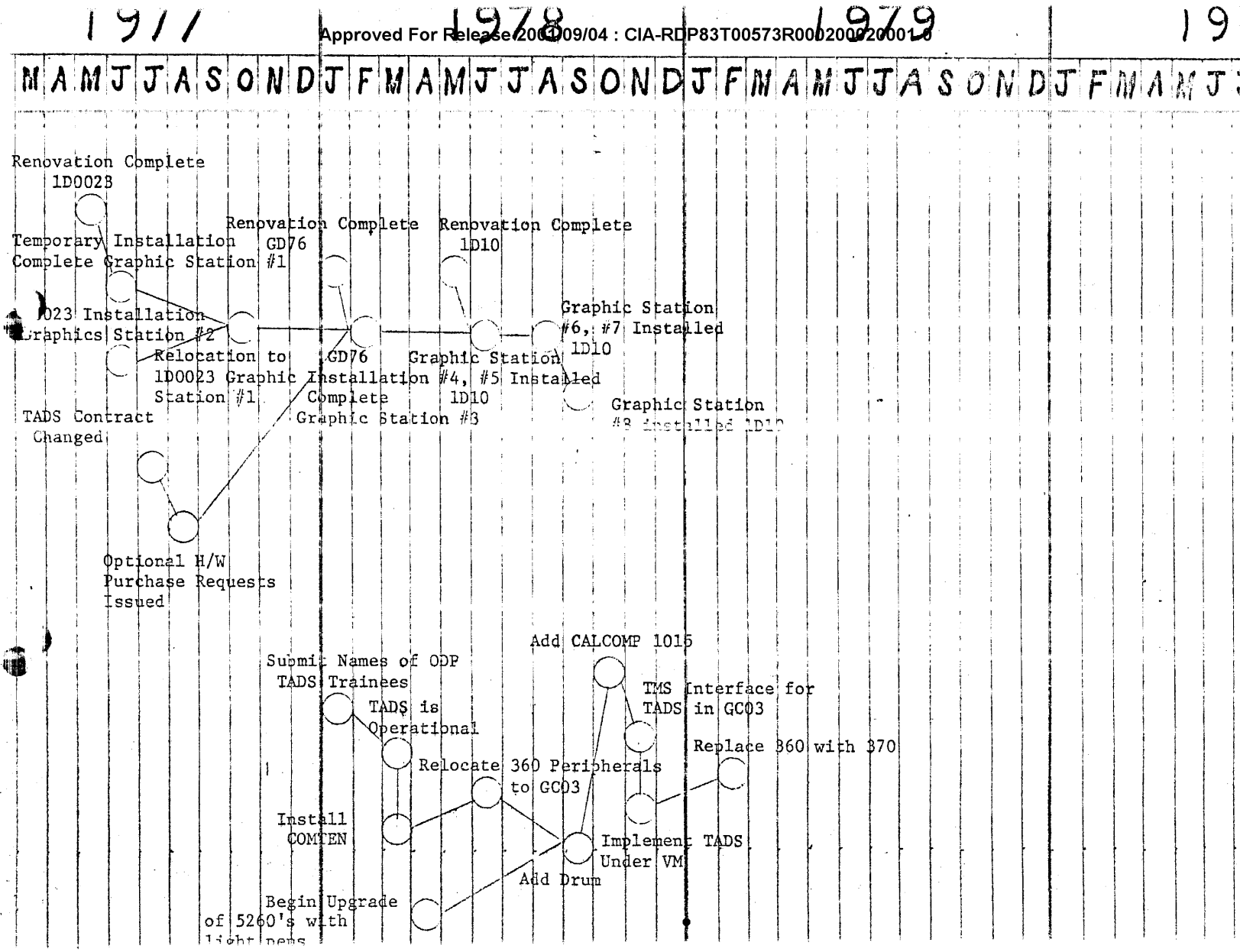
Figure three, the recommended TADS hardware configuration, gives an overview of the proposed TADS system. Figure three may be contrasted with figure two for a pictorial representation of the differences between the planned hardware configuration and the proposed hardware configuration for TADS.

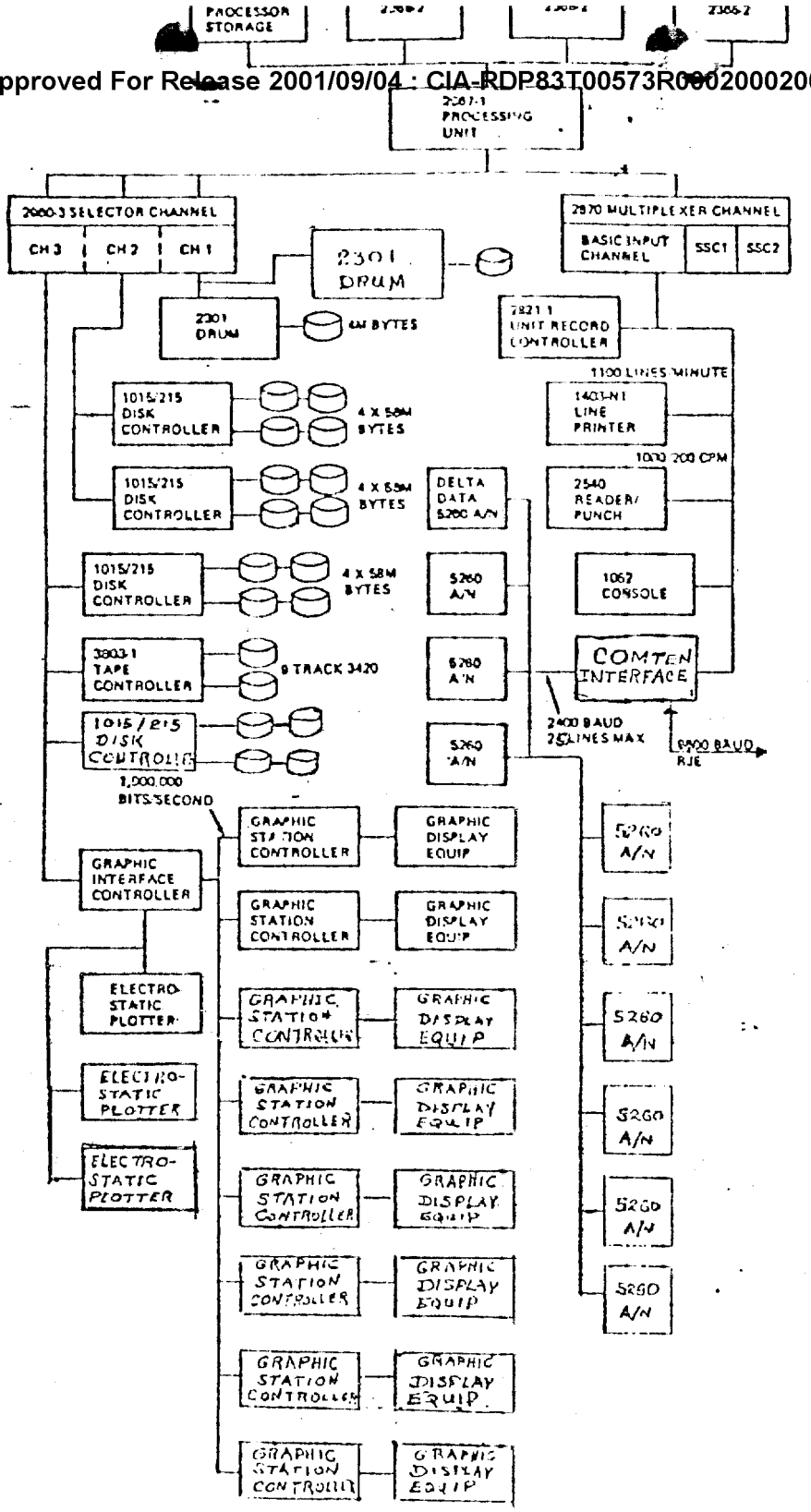
BUDGET ANALYSIS

Below is a comparison of the FY-77 TADS Budget for contract services as it is currently defined with how it might be applied if the recommendations presented in this paper are followed.

Fiscal Year	Budget*	Current Plan	Proposed Plan
FY-1976	$1,673	Initial System	Initial System
FY-1977	$ 845	5 Graphic Stations	6 Graphic Stations 2 Plotters TMS interface Delta Data's
FY-1978	$ 270	H/W & S/W Maint.	H/W & S/W Maint. Delta Data's
FY-1979	$ 299 $ 136 $ 494	H/W & S/W Maint. Graphic Stations 1 Plotter	H/W & S/W Maint. COMTEN Disk Storage Delta Data's

*1000's of dollars





Recommened TADS Hardware Configuration

Figure 3

APPENDIX A

GOVERNMENT-FURNISHED PROPERTY LIST

The following components will be furnished by the Government to be integrated into the Telemetry Analysis and Display System.

HARDWARE

a. One IBM 2076 Central Processor Unit with one megalyte of core storage

b. One IBM 2860 Model 3 Selector Channel

c. One IBM 2870 Byte Multiplexor Channel

d. One IBM 1052 Console

e. One IBM 2820 Drum Control Unit

f. One IBM 2301 Drum with 4 megalyte capacity

g. Three CALCOMP 1015 Disk Controller Units

h. Six CALCOMP 215 Disk Units

i. One Memorex 1270 Terminal Control Unit configured for 24 asynchronous lines operating at 2400 baud and 8 binary synchronous lines operating at 9600 baud.

j. One RJE link to ASP

k. One STC 3800 Magnetic Tape Controller

l. Two STC 3400 9-Track Tape Drives

m. One IBM 2821 Unit Record Controller

n. One IBM 1403-NI Printer

o. One IBM 2540 Card Reader/Punch

p. Four Delta Data 5260 with light pen

SOFTWARE

a. CP-67 version 3.1

b. CMS version 3.1

c. BATCHMON

d. DEBE

e. GOTO

f. NSCRIPT

g. SEDIT

h. SDUMPF

i. SSORT

j. SSPLIB

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CONTRACTOR FURNISHED PROPERTY LIST

HARDWARE

a. One Graphics Interface Controller

1. One PDP 11/34 System with 32K words of MOS Memory, RK11J/RK05 Disks, Memory Management Boot Strap Loader, DEC Writer and Cabinet.

2. One VT50-AA CRT Terminal

3. One Portable Paper Tape Reader

4. One Electrostatic Printer Plotter

b. Two Graphics Stations

1. Two PDP/11/34 Systems with 32K words MOS Memory, Memory Mgt, EIS, Bootstrap Loader

2. Two Integrated Consoles

3. Two Vector General Displays (Model 3401)

c. One Data Tablet and interface

SOFTWARE

a. TADS Software

1. IBM 360/67 - CP/CMS

2. Graphics Support

3. VMBAT

4. VMBBATS

5. VMTADS

6. VMNET

7. VMPLOT